

Polynomials

Unit 6

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Algebra 2
Classifying Polynomials

Name: _____
Date: _____

Name each polynomial by degree and number of terms.

1. $2x^4 + x^3$	2. $-10x^3$
3. $2x^2$	4. $-10k^2 + 7$
5. $-5x^4 + 10x - 10$	6. $-6x^4 + 10x^3$
7. $6x$	8. 1
9. $9x + 10$	10. $5x^2 + 6x$
11. $8x^5 - 5x^3 + 2x^2 - 7$	12. $-7x^7 + 7x^4$
13. $-8x^4 + 5x^3 - 2x^2 - 8x$	14. $9x^7 + 7x^6 + 4x^3 - 1$
15. $9x^2 + 3x$	16. -6
17. $-10x^4 + x^2 - x$	18. $8x + 1$
19. $9x^6 - 8$	20. $9x^5 - 8x^3$
21. $2x^5$	22. $4x - 9x^2 + 4x^3 - 5x^4$
23. $-4 - 2x^2 + 8x$	24. $7x^5 + 10x^4 - 3x + 10x^7$
25. -1	26. 4

Write each polynomial in standard form.

1. $4x + 9x^3 - 17 \rightarrow$
2. $8x^2 + 2x^4 - 11 + 6x \rightarrow$
3. $7x^4 - 9x^7 - 13x - 5x^3 \rightarrow$
4. $\frac{3}{4}x^2 + \frac{5}{8}x^5 - \frac{7}{9}x \rightarrow$
5. $\frac{1}{2} + \frac{3}{7}x^4 - \frac{2}{5}x^2 + \frac{8}{9}x \rightarrow$

Determine whether each expression is a polynomial. If so, classify the polynomial by degree and by number of terms.

6. $9x^2 + 4x - 8$		
7. $4x^{-3} + 7x^{-2} + 5$		
8. $14ab^2c^2$		
9. $2\sqrt{x} + 5$		
10. $\frac{4}{5}x^3 + \frac{2}{3}x$		
11. $7^{2x} + 4^x - 11$		
12. $\frac{2}{x^2} + \frac{5}{x} - \frac{8}{9}$		

Determine whether each expression is a polynomial. If so, classify the polynomial by degree and by number of terms.

1. $3x^2 + 2x + 1$ _____ 2. $4x^3 + 5x^2 - 7x + 2$ _____
 3. $\frac{6}{x^2} + \frac{2}{x} - 3$ _____ 4. $\frac{1}{2}x^4 - 3x^2 + 5$ _____

Classify each polynomial as a monomial, a binomial, or a trinomial. Then give the degree of the polynomial.

1. $-0.7a^{15}$ 2. $4x^3 - \sqrt{13}x + 1$ 3. -7 4. $6x^2y^2 - 4x^5$

Tell whether each expression is a polynomial.

1. $3xy - 5$ 2. $\frac{1}{4}a^2 + a$ 3. $4x^2 + 3x - \frac{7}{x}$

Adding and Subtracting Polynomials

Date _____ Period _____

Simplify each expression.

1) $(5p^2 - 3) + (2p^2 - 3p^3)$

2) $(a^3 - 2a^2) - (3a^2 - 4a^3)$

3) $(4 + 2n^3) + (5n^3 + 2)$

4) $(4n - 3n^3) - (3n^3 + 4n)$

5) $(3a^2 + 1) - (4 + 2a^2)$

6) $(4r^3 + 3r^4) - (r^4 - 5r^3)$

7) $(5a + 4) - (5a + 3)$

8) $(3x^4 - 3x) - (3x - 3x^4)$

9) $(-4k^4 + 14 + 3k^2) + (-3k^4 - 14k^2 - 8)$

10) $(3 - 6n^5 - 8n^4) - (-6n^4 - 3n - 8n^5)$

11) $(12a^5 - 6a - 10a^3) - (10a - 2a^5 - 14a^4)$

12) $(8n - 3n^4 + 10n^2) - (3n^2 + 11n^4 - 7)$

13) $(-x^4 + 13x^5 + 6x^3) + (6x^3 + 5x^5 + 7x^4)$

14) $(9r^3 + 5r^2 + 11r) + (-2r^3 + 9r - 8r^2)$

15) $(13n^2 + 11n - 2n^4) + (-13n^2 - 3n - 6n^4)$

16) $(-7x^5 + 14 - 2x) + (10x^4 + 7x + 5x^5)$

$$17) (7 - 13x^3 - 11x) - (2x^3 + 8 - 4x^5)$$

$$18) (13a^2 - 6a^5 - 2a) - (-10a^2 - 11a^5 + 9a)$$

$$19) (3v^5 + 8v^3 - 10v^2) - (-12v^5 + 4v^3 + 14v^2)$$

$$20) (8b^3 - 6 + 3b^4) - (b^4 - 7b^3 - 3)$$

$$21) (k^4 - 3 - 3k^3) + (-5k^4 + 6k^3 - 8k^5)$$

$$22) (-10k^2 + 7k + 6k^4) + (-14 - 4k^4 - 14k)$$

$$23) (-7n^2 + 8n - 4) - (-11n + 2 - 14n^2)$$

$$24) (14p^4 + 11p^2 - 9p^5) - (-14 + 5p^5 - 11p^2)$$

$$25) (8k + k^2 - 6) - (-10k + 7 - 2k^2)$$

$$26) (-9v^2 - 8u) + (-2uv - 2u^2 + v^2) + (-v^2 + 4uv)$$

$$27) (4x^2 + 7x^3y^2) - (-6x^2 - 7x^3y^2 - 4x) - (10x + 9x^2)$$

$$28) (-5u^3v^4 + 9u) + (-5u^3v^4 - 8u + 8u^2v^2) + (-8u^4v^2 + 8u^3v^4)$$

$$29) (-9xy^3 - 9x^4y^3) + (3xy^3 + 7y^4 - 8x^4y^4) + (3x^4y^3 + 2xy^3)$$

$$30) (y^3 - 7x^4y^4) + (-10x^4y^3 + 6y^3 + 4x^4y^4) - (x^4y^3 + 6x^4y^4)$$

Add or subtract the following polynomials

1. $(4x^2 + 4x + 1) + (4x + 20)$	2. $(-7x^2 + 9x - 15) + (8x - 8)$
3. $(5x^3 - 6x + 10) + (x^3 + 10x - 9)$	4. $(3x^2 + 3x - 9) + (5x^2 + 7x^3 - 4)$
5. $(8x^2 + 4x + 1) + (5x^2 + 4x + 16)$	6. $(-x^2 + 5x + 9) + (-x^2 + 6x + 9)$
7. $(-12x^3 - 8x^2 - 7) + (6x^3 + 9x^2 - x)$	8. $(2x^3 - 7x^2 + 16) + (6x^3 + 5x^2 - 1)$
9. $(9x^2 - 7x + 55) + (3x + 8)$	10. $(7x^3 + 4x + 1) + (4x^2 + 20x^5)$
11. $(6x^2 + 4x + 1) - (4x + 20)$	12. $(-7x^9 + 12x^6 - 12) - (5x^9 + 4x^6 - 9)$
13. $(8x^3 - 6x + 10) - (x^3 + 10x - 9)$	14. $(4x^8 + 3x - 34) - (5x^8 + 70x - 42)$
15. $(-9x^2 + 44x + 2) - (7x^2 + 10x + 99)$	16. $(-8x^2 + 15x + 28) - (-x^2 + 44x + 9)$
17. $(-16x^3 - 12x^2) - (6x^3 - 11x^2 - x)$	18. $(4x^6 - 9x^7 + 16) - (5x^6 + 25x^7 - 10)$
19. $(9x^2 - 7x + 65) - (11x + 8x^2)$	20. $(9x^5 + 4x + 1) - (9x^3 + 2x^5)$
21. Simplify $(xy^2 + 4x + 2y^2) + (4xy + 7x^2 - 10y^2) - (3y^2 - 3x^2 - 3xy)$	
22. Simplify $(y^2 + 10xy^2 - 9x + 11x^2) - (8x^2 - 55xy - 4y^2) + (-8y^2 - 11x^2 - 9xy)$	

Write each sum or difference as a polynomial in standard form

1. $(12x + 7) + (4x + 7) =$

2. $(9x - 2) + (7x + 8) =$

3. $(14x - 9) - (5x + 4) =$

4. $(7x - 3) - (15x + 4) =$

5. $(9x^2 - 4x + 8) + (4x^2 - 3x + 9) =$

6. $(7x^2 - 9x + 1) + (4x^2 + 5x - 9) =$

7. $(14x^2 - 7x - 11) - (8x^2 - 5x - 2) =$

8. $(4x^2 - 9x + 2) - (11x^2 + 5x - 8) =$

9. $(8x^3 + 4x^2 - 3x + 13) + (7x^3 + 5x - 9) =$

10. $(9x^2 - 2x + 4) + (7x^3 - 5x^2 + 2x + 6) =$

11. $(7x^3 - 4x^2 + 8x + 5) - (2x^3 - 5x + 11) =$

12. $(5x^3 - 11x^2 + 6) - (12x^3 - 5x^2 + 4x - 9) =$

13. $(11x^5 - 8x^3 + 3) + (6x^3 - 7x^2 + 5) =$

14. $(11x^4 + 7x - 4) - (9x^4 + 4x^2 - 13x + 2) =$

Find each product.

1. $6x(2x + 3)$	2. $7(-5x - 8)$
3. $2x(-2x - 3)$	4. $-4(x + 1)$
5. $(2x + 2)(6x + 1)$	6. $(4x + 1)(2x + 6)$
7. $(x - 3)(6x - 2)$	8. $(8x - 2)(6x + 2)$
9. $(6x + 8)(5x - 8)$	10. $(3x - 1)(8x + 7)$
11. $(2x - 1)(8x - 5)$	12. $(5x + 6)(5x - 5)$

13. $(4x - 1)^2$	14. $(7x - 6)(5x + 6)$
15. $(6x + 3)(5x + 5)$	16. $(8x + 1)(6x - 3)$
17. $(6x + 5)(5x + 5)$	18. $(3x - 4)(4x + 3)$
19. $(4x + 2)(6x^2 - x + 2)$	20. $(7x - 3)(x^2 - 2x + 7)$
21. $(7x^2 - 6x - 6)(2x - 4)$	22. $(x^2 + 6x - 4)(2x - 4)$
23. $(6x^2 - 6x - 5)(7x^2 + 6x - 5)$	24. $(x^2 - 7x - 6)(7x^2 - 3x - 7)$

Multiply.

- | | | |
|-----------------------------------|---------------------------------|--------------------------|
| 1. $x(4 - 3x)$ | 2. $-5(x^2 - 1)$ | 3. $-3x^2(x^2 + x - 1)$ |
| 4. $0.5d(a + b + c)$ | 5. $(x + 3)(2x - 4)$ | 6. $(4x + 7)(4x - 1)$ |
| 7. $(11 - x)(x + 3)$ | 8. $(2x - 1)(1 - x)$ | 9. $(x + 5)(x - 8)$ |
| 10. $(x - 9)(2x - 5)$ | 11. $(5x - 17)(x + 2)$ | 12. $(x + 2)(13 - 4x)$ |
| 13. $(3x - 11)(x - 6)$ | 14. $(4x - 5)(3x - 8)$ | 15. $(2a + 3b)(a - 7b)$ |
| 16. $(4x + y)(2x - y)$ | 17. $(3x - y)(2x + y)$ | 18. $(2x + 3y)(2x - 5y)$ |
| 19. $(x^2 - y^2)(x - y)$ | 20. $(xy - 2)(xy + 4)$ | 21. $(2a - c)(3b + 5d)$ |
| 22. $(x + y)(3m - 5n)$ | 23. $(x - 2)^2$ | 24. $(c + 7)^2$ |
| 25. $(2w + 3t)^2$ | 26. $(z - 2y)^2$ | 27. $(c + 9)(c - 9)$ |
| 28. $(a - 5)(5 + a)$ | 29. $(3a + 4)(3a - 4)$ | 30. $(4x - y)(4x + y)$ |
| 31. $(2a - 5)(4a^2 + 7a - 3)$ | 32. $(d + 3)(d^2 - 3d + 8)$ | |
| 33. $(2x + 3)(4x^2 - 6x + 9)$ | 34. $(x^2 - xy + y^2)(x - y)$ | |
| 35. $(a + b)(a^2 - ab + b^2)$ | 36. $(5 - 2a)(25 + 10a + 4a^2)$ | |
| 37. $(x - y)(x^2 + xy + y^2)$ | 38. $(y^2 - 1)(y^4 + y^2 + 1)$ | |
| 39. $(x + y)^2(x - y)$ | 40. $(a - b)^2(a + b)$ | |
| 41. $(3 + 2y)^2(4 - 3y)$ | 42. $(3a + 2b)(2a - b)^2$ | |
| 43. $(2d - 1)(d + 4)(3d - 5)$ | 44. $(2s + 3)(4s - 1)(3s + 7)$ | |
| 45. $(2x^2 + 3x)(x + 4)(x^2 - 8)$ | 46. $(9c - d)(2d - c)(3c + d)$ | |

Multiplication of Polynomials

Multiply.

1. $4(3a + 7)$ _____
2. $y^2(y^2 - 8y + 6)$ _____
3. $-5d^2(2a - 3b + c)$ _____
4. $(a + 4)(a + 5)$ _____
5. $(y - 3)(y - 7)$ _____
6. $(n + 6)(n - 2)$ _____
7. $(3x + 1)(x + 5)$ _____
8. $(6a + b)(3a + 2b)$ _____
9. $(5c - 3d)(2c - d)$ _____
10. $(a + 6)(a - 6)$ _____
11. $(n + 3)(n^2 + 5n - 1)$ _____
12. $(2r + 3)^3$ _____

Multiply

1. $-6(7a^2 + 9a - 4) =$

2. $4x^2y(6x^2y - 7xy + 2xy^2) =$

3. $(4x + 9)(x + 2) =$

4. $(9x - 5)(3x + 2) =$

5. $(5a + 4b)(2a - 7b) =$

6. $(8a - 5b)(3a + 4b) =$

7. $(4x + 9)^2 =$

8. $(6a - 5b)^2 =$

9. $(9x + 7y)(9x - 7y) =$

10. $(x + 6)(x^2 + 4x - 9) =$

11. $(4a + 3b)(9a^2 - 5ab - 2b^2) =$

12. $(2x + 7)(x + 6)(4x - 5) =$

13. $(3a + 2b)^2(2a + 5b) =$

14. $(2x + 5)(4x - 1)^2 =$

Dividing Polynomials

Date _____ Period _____

Divide.

1) $(m^2 - 7m - 11) \div (m - 8)$

2) $(n^2 - n - 29) \div (n - 6)$

3) $(n^2 + 10n + 18) \div (n + 5)$

4) $(k^2 - 7k + 10) \div (k - 1)$

5) $(n^2 - 3n - 21) \div (n - 7)$

6) $(a^2 - 28) \div (a - 5)$

7) $(r^2 + 14r + 38) \div (r + 8)$

8) $(x^2 + 5x + 3) \div (x + 6)$

9) $(2x^2 - 17x - 38) \div (2x + 3)$

10) $(42x^2 - 33) \div (7x + 7)$

$$11) (x^2 - 74) \div (x - 8)$$

$$12) (2p^2 + 7p - 39) \div (2p - 7)$$

$$13) (n^3 + 7n^2 + 14n + 3) \div (n + 2)$$

$$14) (p^3 - 10p^2 + 20p + 26) \div (p - 5)$$

$$15) (v^3 - 2v^2 - 14v - 5) \div (v + 3)$$

$$16) (x^3 - 13x^2 + 40x + 18) \div (x - 7)$$

$$17) (k^3 - 30k - 18 - 4k^2) \div (3 + k)$$

$$18) (-5k^2 + k^3 + 8k + 4) \div (-1 + k)$$

$$19) (x^3 + 5x^2 - 32x - 7) \div (x - 4)$$

$$20) (50k^3 + 10k^2 - 35k - 7) \div (5k - 4)$$

Divide.

1. $(8x^2 + 4x) \div 2x$

2. $(16x^3 + 4x + 20) \div 4x$

3. $(30x^3 + 50x) \div 5x$

4. $(12x^3 + 16x^2 - 8x) \div 2x$

5. $(27x^3 + 12x) \div 3x^2$

6. $(36x^4 - 48x) \div -6x$

7. $(x^2 + 7x + 10) \div (x + 2)$

8. $(x^2 - 3x - 54) \div (x + 9)$

9. $(x^2 + 6x + 9) \div (x + 3)$

10. $(x^2 - 25) \div (x + 5)$

11. $(3x^3 + 11x^2 + 9x - 5) \div (x + 2)$

12. $(x^2 + 5x + 8) \div (x + 2)$

13. $(x^2 - 10,000) \div (x - 100)$

14. $(x^3 + 9x^2 + x + 9) \div (x + 9)$

15. $(2x^2 + 3x - 65) \div (2x + 13)$

16. $(12m^2 + 57m + 66) \div (4m + 11)$

17. $(x^4 - 5x^3 - 7x^2 + 36x - 5) \div (x - 5)$

18. $(-x^2 - 94x + 600) \div (x + 100)$

19. $(6x^2 + 5x - 50) \div (2x - 5)$

20. $(4x^3 - 8x + 3) \div (x + 2)$

21. $(x^3 + 7x^2 + 16x + 12) \div (x + 2)$

22. $(y^3 - 3y^2 - 17y + 3) \div (y + 3)$

23. $(x^3 + 10x^2 + 32x + 33) \div (x + 3)$

24. $(y^3 - 2y^2 - 45y - 50) \div (y + 5)$

25. $(2x^3 - 11x^2 - 2x + 2) \div (2x + 1)$

26. $(12y^3 + 27y^2 + 75y + 65) \div (3y + 3)$

27. $(15x^3 + 37x^2 + 53x + 55) \div (3x + 5)$

28. $(16y^3 + 44y^2 - 40y + 7) \div (2y + 7)$

Divide by using long division.

3. $(x^3 + 4x^2 - 19x + 14) \div (x + 7)$ _____

4. $(x^3 - 6x^2 + 11x - 6) \div (x - 2)$ _____

Divide by using synthetic division.

5. $(2x^3 - 11x^2 - 5x - 6) \div (x - 6)$ _____

6. $(-2x^3 - 3x^2 - x - 6) \div (x + 2)$ _____

Divide by using long division.

13. $(2x^2 + 7x - 30) \div (x + 6)$

14. $(6x^2 + 2x - 5) \div (3x + 5)$

15. $(8x^3 + 12x^2 + 6x + 5) \div (2x + 1)$

16. $(5x^3 + x^2 - x + 3) \div (x + 1)$

Divide by using synthetic division.

17. $(x^3 - x^2 + x - 21) \div (x^2 + 2x + 7)$

18. $(x^3 - 5x^2 - 20x - 32) \div (x - 8)$

19. $(x^3 + 4x^2 + 4x + 3) \div (x^2 + x + 1)$

20. $(x^5 - x^3 - 3) \div (x^2 - 3)$

Divide by long division and by synthetic division.

10. $(x^3 + 2x^2 - 10x - 15) \div (x - 3)$

11. $(x^2 - x - 42) \div (x + 6)$

Divide by using long division or synthetic division.

9. $(x^2 - 5x - 14) \div (x + 2)$

10. $(x^2 - 10x + 24) \div (x - 6)$

11. $(x^3 + 2x^2 - 3x + 20) \div (x + 4)$

12. $(x^3 - 7x^2 + 6x + 8) \div (x - 2)$

13. $(x^2 + 15x + 50) \div (x + 5)$

14. $(x^3 - 2x^2 - 5x - 12) \div (x - 4)$

15. $(x^3 - 9x^2 + 14x + 19) \div (x - 3)$

16. $(x^3 - 6x^2 - 48x - 43) \div (x + 4)$

1. $(x^3 - 3x^2 - 108x) \div (x - 12)$	2. $(-4x^3 + 72x^2 - 288x) \div (x - 12)$
3. $(-2x^3 + 14x^2 + 36x) \div (x + 2)$	4. $(-x^3 + 13x^2 - 22x) \div (x - 11)$
5. $(x^3 + 9x^2 + 20x) \div (x + 5)$	6. $(3x^3 + 15x^2 - 252x) \div (x - 7)$
7. $(-4x^3 + 52x^2 - 120x) \div (x - 10)$	8. $(x^4 - 20x^3 + 98x^2 + 20x - 99) \div (x - 11)$
9. $(x^4 + 3x^3 - 43x^2 - 75x + 450) \div (x - 3)$	10. $(2x^3 - 12x^2 + 10x) \div (x - 5)$
11. $(3x^3 + 3x^2 - 216x) \div (x - 8)$	12. $(4x^3 - 80x^2 + 400x) \div (x - 10)$
13. $(3x^3 - 30x^2 + 48x) \div (x - 8)$	14. $(-x^3 - 3x^2 + 40x) \div (x + 8)$

15. $(-x^3 + 4x^2 + 45x) \div (x + 5)$	16. $(x^4 - 13x^3 + 4x^2 + 468x - 1440) \div (x - 8)$
17. $(-5x^5 - 2x^4 + 32x^3 - 48x + 32) \div (x + 2)$	18. $(-4x^3 + 48x^2 - 140x) \div (x - 7)$
19. $(x^4 - 10x^3 + 100x^2 - 1000x) \div (x - 10)$	20. $(-3x^3 - 66x^2 - 360x) \div (x + 10)$
21. $(-x^3 + x^2 + 20x) \div (x + 4)$	22. $(x^5 + 3x^4 - 65x^3 - 195x^2 + 64x + 192) \div (x + 3)$
23. $(-10x^4 + 96x^3 + 157x^2 - 51x + 198) \div (x + 2)$	24. $(-2x^3 - 38x^2 - 168x) \div (x + 12)$
25. $(-2x^3 + 26x^2 - 44x) \div (x - 11)$	26. $(x^4 + 3x^3 - 43x^2 - 9x + 120) \div (x + 8)$

I. Classifying Polynomials

Expression	Polynomial (yes/no)	List the Coefficients	Degree of Polynomial	# of terms (name)
1) $4y^4x + 6x$				
2) $x + \frac{3x^3}{5} - 5x^2 + 7$				
3) 987				
4) $6x^{-4}$				
5) $\sqrt[3]{8x}$				
6) $3y + 8x + z$				
7) $12x + 3xy^3 - 7x^2y^2$				
8) $5x^2 + 9$				

II. Adding, Subtracting & Multiplying Polynomials

Simplify:

9) $(6x^4 + 3x - 8) - (3x^4 + 2) =$

10) $(4x^3y - 3yx^2 + 8) + (18 + 5x^3y - 2x^2y) =$

11) $(4y - 6) + (7y^2 + 6y - 2) - 3(10y^2 + 6y) =$

12) $(6x + 4) - (3x^2 - 7x + 7) + (12x^2 - 14x + 5) =$

13) $7a(4a^3b + 7ab - 10) =$

$$14) (7y + 4)(7y - 4) =$$

$$15) (x^3 - 2)^2 =$$

$$16) (y + 2)^2 + 4(y^2 + 2y + 3) =$$

$$17) (x - 3)^2(x^2 + 3x - 1) =$$

III. Dividing Polynomials

Simplify:

$$18) \frac{48a^5b^{10}}{8ab^7} =$$

Use Long Division:

$$19) (x^4 + 2x^3 - 3x^2 - 3x - 14) \div (x - 2 + x^2)$$

$$20) (-6 + 7x^2 + 8x^3 + 2x + 4x^4) \div (2x + 3)$$

Use Synthetic Division:

$$21) (x^4 - 3x^3 + 2x^2 - 14x + 24) \div (x - 3)$$

$$22) \frac{x^4 - 2x^3 - 8x + 16}{x + 2}$$